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AUTHOR Tubbs, Stewart L.; Koske, W. Cary
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ABSTRACT

Ongoing research programs conducted at General Motors Institute are motivated by the practical objective of improving the company's organizational effectiveness. Computer technology is being used whenever possible; for example, a technique developed by Herman Chernoff was used to process data from a survey of employee attitudes into 18 different factors and then to represent the data by means of geometrically constructed faces. Each of the factors was represented by a specific facial feature: job satisfaction by mouth curvature, pay satisfaction by nose length, work group satisfaction by length of mouth, communication satisfaction by angle of eyebrow, satisfaction with supervisory goal emphasis by eye length, and so on. The faces provide a convenient and effective means of highlighting important aspects of the data. In reporting results of ongoing programs, General Motors personnel are attempting to use verbal and nonverbal methods to make the findings understandable to others. (The paper includes illustrations of faces compiled from the employee attitude data, a table of relevant data, and an explanation of the way facial features were controlled by the factors obtained from the data.) (GW)

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APPLYING NONVERBAL TECHNIQUES TO ORGANIZATIONAL DIAGNOSIS

by

Stewart L. Tubbs

Department of Communication and Organizational Behavior

General Motors Institute

and

W. Cary Koske

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CS 502 248

APPLYING NONVERBAL TECHNIQUES TO ORGANIZATIONAL DIAGNOSIS

At last year's ICA conference in Montreal, The Honorable Gerald Pelletier, Minister of Communications of Canada stated:

> We need to move beyond the implementation of communication systems into the study of how such systems will affect society, and what kinds of technology should be utilized to improve human communication. . . Although we have more and more sophisticated communication technology, we have not made much visible progress in really understanding each other. . .
>
> First, [communication] research should have some practical application as a motivation factor. Too often we are inundated with esoteric pieces of research, which may be academically sound, but have no relevance in solving the many problems we face. The funds are limited, and public utility is a key factor in determining how these funds are allocated. Second, do not be afraid to get your hands dirty dealing directly with pieces of equipment. We need to know a lot more about how we can best use the available technology, and only experience in handling new technology can tell us what improvements are needed. Third, try to describe your work in such a way that interested laymen can understand. . . What we have here is a 'failure to communicate,' which must be overcome if the goal of humanization is to be achieved as opposed to simply being talked about. (ICA Newsletter, 22, June, 1973, p. 1)

The present paper represents an attempt to describe a research project that follows the three guidelines set forth in the address quoted above: (1) practical application, (2) utilizing technology, and (3) increasing understandability.

Motivated by Practical Application

The need to synthesize application with theory and research has been discussed previously (Tubbs, 1972). One of the arenas which critically needs the help of communication researchers is business and industry. Numerous industrial organizations are turning to behavioral scientists in an attempt to improve organizational affectiveness (Resser, 1972). This

trend is toward applying high quality research to real-life problems. The research programs conducted in General Motors by the Department of Communication and Organizational Behavior at General Motors Institute, are motivated by a desire to achieve this goal (Hain, Schwendiman, Tubbs, Widgery, and Zima, 1972; Zima, 1972; Richetto, 1973; Tubbs, 1973a). This change effort is termed Organizational Development (OD) and the methodology for this type of program has been detailed elsewhere (Tubbs, 1973c). Basically, it involves the use of a survey questionnaire which is administered to large samples within an ongoing organization. The survey used is a brief form of Survey of Organizations developed by Likert (1967). The survey method is used in an attempt to develop a method of human resources accounting (HRA). By improving the accountability for an organization's human resources, it is believed that significant improvements can be expected in both the organization's work climate and its operating performance (Likert, 1973). This point of view can be easily recognized in the General Motors definition of organizational development which is, "A planned and systematic approach to organizational assessment and organizational change, proceeding from a broad and flexible view of organizational behavior, with the primary goal being to improve the processes by which the business functions and to alter those human and technical features which limit the organization and its employes from achieving this full potential."

The significant role of communication in the process of diagnosing organizational effectiveness has already been demonstrated (Hain and Widgery, 1973). For example, it was found that a significant correlation existed between communication effectiveness and employe satisfaction. It was also found that a significant negative relationship exists between

communication effectiveness and supervisory leadership discrepancy (defined as the discrepancy between the real and ideal ratings).

The present study is part of an ongoing research program to determine the ways in which improved communication can lead to a very practical end result, namely, improved organizational effectiveness in General Motors facilities.

Utilizing Technology

Although several research programs have utilized a computer analysis of data, this study represents the first attempt to specifically apply a new technique in data analysis and display to the area of organizational development. The technique recently developed by Herman Chernoff (1971), Department of Statistics, Stanford University, uses a relatively new method of graphic representation of multivariate data. The program consists of mapping a vector-valued data point (presently limited to 18 or fewer components) into a geometrically constructed face.

The two dimensional face constructed from the data can serve as a potentially helpful tool, namely that of a multivariate histogram. An important characteristic of the face technique which is extremely useful when applying the data to it, is that certain variables can control specific features of the face. Thus attention can be directed to the mouth (i.e., the three variables controlling the position and shape of the mouth), to the nose (i.e., the variable controlling the length of the nose), etc., or to the global impression of the facial characteristics. Because of this characteristic, relevant information can be distinguished much more easily.

The usefulness of this technique was recently explored at a General Motors plant. The plant is currently undergoing an organizational development program. Surveys (based on those developed by Rensis Likert at the Institute of Social Research) were distributed to 238 hourly and salaried employes to determine their attitudes and feeling about the internal workings of the organization.

After the data were collected, it was processed and grouped into factors. The faces program was then employed to provide a faster means of analyzing the data and also as a useful communication tool for upper management.

An example of Chernoff's program can be seen in a few of the faces generated from the survey data. Each face represents a particular group of employes, either hourly or salary. The factors deemed most important by upper management were selected to control the features of the face which most affects its appearance. (A list of those factors and the features of the face they control appears below.)

The following interpretations of those faces will consider only these five out of the eighteen factors for simplication:

1. Job satisfaction (curvature of mouth).
2. Pay satisfaction (length of nose).
3. Work group satisfaction (length of mouth).
4. Communication (angle of eyebrow).
5. Supervisory goal emphasis (length of eye).

These particular groups revealed the following information with respect to the previously mentioned factors (for data see Table 1).

Face #1

(1) Job satisfaction - slightly satisfied but not to a great extent.

(2) Pay satisfaction - very satisfied with pay.

(3) Work group satisfaction - slightly dissatisfied with people in work group.

(4) Communication - neither satisfied or dissatisfied just adequate.

(5) Supervisory goal emphasis - lacking in goal emphasis and fairly dissatisfied.

Face #2

(1) Job satisfaction - very satisfied with job.

(2) Pay satisfaction - fairly satisfied with pay.

(3) Work group satisfaction - very satisfied with people in work group.

(4) Communication - slightly satisfied but not a great extent.

(5) Supervisory goal emphasis - very satisfied with supervisor's emphasis for a goal.

Face #3

(1) Job satisfaction - neither satisfied nor dissatisfied but rather neutral about feeling toward job.

(2) Pay satisfaction - slightly dissatisfied with pay.

(3) Work group satisfaction - neither satisfied with work group nor dissatisfied.

(4) Communication - neither satisfied nor dissatisfied just adequate.

(5) Supervisory goal emphasis - fairly satisfied.

Face #4

(1) Job satisfaction - feels very negative and dissatisfied with job.

(2) Pay satisfaction - neither satisfied nor dissatisfied with pay.

(3) Work group satisfaction - very satisfied with people in work group.

(4) Communication - slightly satisfied with communication but to a small extent.

(5) Supervisory goal emphasis - very satisfied with goal emphasis.

These faces are not meant to be exact measurements but rather they represent a total "picture" of the data sets for quick reference and for approximate data values.

The "Chernoff faces" provide a convenient means of highlighting important aspects or relations of given information while also serving as an effective communicating device.*

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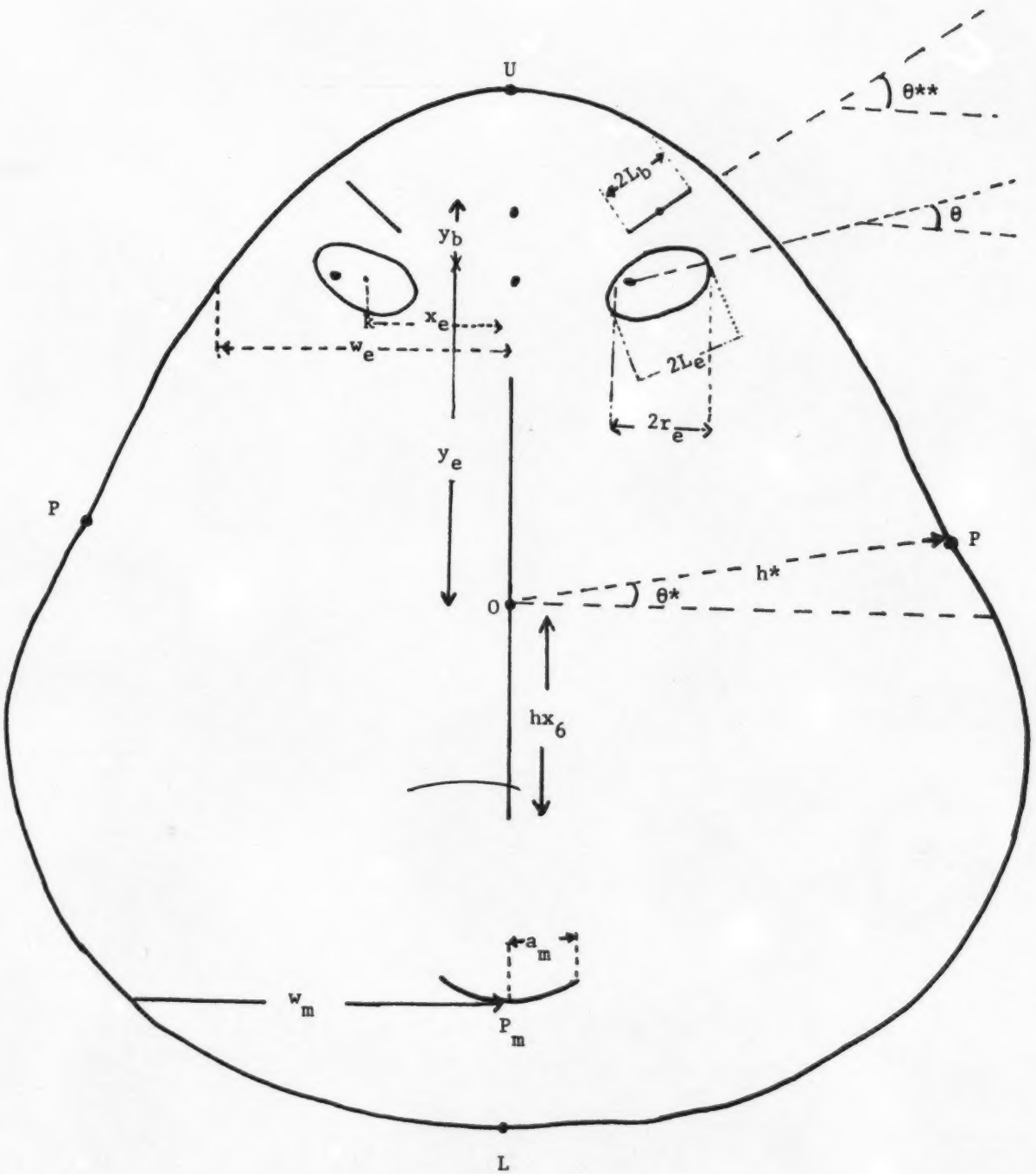
*This project was run using an IBM 370/165 computer and a Stromberg-Carlson 4060 plotter.

TABLE 1

"Chernoff Faces" Data

Parameter	Factor	Means			
		Face #1	Face #2	Face #3	Face #4
X_1	Peer Goal Emphasis	3.83	3.89	3.60	3.75
X_2	Intra-Group Coordination	3.33	3.28	3.42	3.50
X_3	Peer Team Building	2.50	2.94	2.90	3.25
X_4	Supervisory Support	3.44	2.76	3.05	3.00
X_5	Peer Support	3.33	3.54	3.35	4.00
X_6	Pay	4.33	4.06	3.77	4.00
X_7	Peer Work Facilitation	3.11	3.07	3.09	3.33
X_8	Job Satisfaction	3.00	3.44	3.06	2.50
X_9	Work Group Satisfaction	2.67	4.00	3.16	4.00
X_{10}	Supervisory Work Facilities	2.33	3.61	3.48	4.33
X_{11}	Supervisory Team Building	1.67	3.39	3.11	4.00
X_{12}	Motivation	3.50	3.19	3.16	3.50
X_{13}	Psychological Contract	3.20	3.79	3.30	3.70
X_{14}	Supervisory Goal Emphasis	3.17	4.17	3.90	4.75
X_{15}	Coordination	2.92	3.44	3.10	3.25
X_{16}	Decision-Making	2.75	3.04	3.04	2.63
X_{17}	Communication	2.50	3.00	2.73	3.00
X_{18}	Upward Receptivity	3.00	2.83	2.68	3.00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Parameters Controlling Facial Features

	Parameter			
Face	x_1	controls	h^*	distance from O to P
	x_2	controls	θ^*	angle between OP and horizontal
	x_3	controls	h	half-height of face
	x_4	is		eccentricity of upper ellipse of face (width/height)
	x_5	is		eccentricity of lower ellipse of face (width/height)
Nose	x_6	controls		length of nose
Mouth	x_7	controls	P_m	position of center of mouth
	x_8	controls		curvature of mouth (radius = h/x_8)
	x_9	controls	a_m	length of mouth
Eyes	x_{10}	controls	y_e	height of centers of eyes
	x_{11}	controls	x_e	separation of centers of eyes
	x_{12}	controls	θ	slant of eyes
	x_{13}	is		eccentricity of eyes (L_e also depends in part on x_{10} and x_{11})
	x_{14}	controls	L_e	half-length of eye (L_e also depends in part on x_{10} and x_{11})
	x_{15}	controls		position of pupils
Eyebrows	x_{16}	controls	y_b	height of eyebrow center relative to eye
	x_{17}	controls	$\theta^{**}-\theta$	angle of brow relative to eye
	x_{18}	controls	L_b	length of brow

Increasing Understandability

One problem frequently encountered by researchers is that of effectively communicating their results to others. Even at professional meetings, participants frequently complain that the various methods of presenting papers are quite poor. The problem is compounded when a researcher attempts to communicate to a lay audience. Yet, the organizational interventions strategy of feeding back results of a survey (commonly known as survey feedback) to a client population is considered by some to be an essential part of organizational development (Tubbs, 1973c; Bower, 1972; Bowers and Franklin, 1973). Thus, the question arises, how does one improve the understandability of research findings to a lay audience in an ongoing organization?

It has generally been found that communication effectiveness can be improved when both verbal and nonverbal methods are employed (Mehrabian, 1971) (A more detailed description of nonverbal communication may be found in a number of sources (Knapp, 1972; Eisenberger and Smith, 1972; Tubbs and Moss, 1974). The popularity of nonverbal communication among lay audiences is quite apparent in the success of the best-selling book Body Language (Fast, 1971). Thus, it seems reasonable to assume that the survey feedback methodology could be made more understandable if nonverbal methods were employed. Harrison (1965) has previously demonstrated the validity of pictomorphs to represent fairly reliably perceived states of expression. In the present study, the organizational profiles shown earlier were used in an attempt to simplify the survey feedback procedure.

Summary

This paper represents an attempt to meet the three criteria set forth at last year's ICA convention regarding communication research. First, we are in the process of conducting ongoing research programs which are motivated by the practical objective of improving the organizational effectiveness of General Motors facilities. Second, we are actively utilizing computer technology whenever possible. Finally, we are attempting to improve the communication intervention process itself in an attempt to improve the understandability of our research findings as a subgoal so that eventually the organizational unit affected will be more likely to improve as its employes achieve a fuller utilization of their maximum potential. Further ongoing research will document the extent to which these new techniques are working.

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